

## FOOTWEAR ATTACHMENT INTERFACE AND DEVICES THEREFOR FIELD OF THE INVENTION

The present invention relates generally to interfaces that enable attaching a variety of devices and accessories to footwear, and to devices that may be attached to the footwear by means of the interfaces.

## BACKGROUND OF THE INVENTION

Devices and accessories that may be attached to shoes have been known for a long time. Such devices include the well-known roller skates of the past, which clamped on to and around the shoe of the wearer and were tightened with a skate key.

Other devices include fixtures for orthopedic attachments. For example, US Patent 2,382,821 to Rosenthal (issued August 14, 1945) describes a universal shoe fixture for orthopedic attachments, such as detachable rods or braces that may be attached to and detached from shoes. The fixture consists of a metal plate attached to the bottom of the shoe sole with rivets or the like. A hollow tube is fastened to the bottom of the plate with winged flanges protruding upwards on either side of the shoe. Orthopedic attachments may be affixed to the hollow tube.

Another device, described in US Patent 5,511,824 to Kim, includes convertible roller footwear. An elongate bushing is embedded in the sole of the footwear and extends in a transverse direction of the sole to terminate at opposite open ends. The bushing has an inner circumferential surface and generally hemispherical recesses disposed on the inner circumferential surface in the vicinity of the opposite ends of the bushing. A plurality of roller assemblies are provided, each including a hollow nipple removably fitted into the bushing, the nipple having a radial through-hole formed adjacent to an internal end of the nipple to receive a ball therein, and a pushpin slidably inserted through the nipple. The pushpin has an annular groove for selective communication with the radial through-hole. The pushpin is movable between a pushed-in position for allowing the ball to move radially inwardly into engagement with the annular groove and a pulled-out position for causing the ball to move radially outwardly into engagement with the recesses.

## SUMMARY OF THE INVENTION

The present invention seeks to provide a novel footwear attachment interface that enables attaching a variety of devices and accessories to footwear, as is described in detail hereinbelow. Novel devices that may be attached to the footwear attachment interface are

also described, such as but not limited to, a novel foot paddle assembly, as is described in detail hereinbelow.

### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a footwear attachment interface, constructed and operative in accordance with an embodiment of the present invention;

Figs. 2 and 3 are simplified sectional illustrations of the footwear attachment interface of Fig. 1, respectively prior and after installation in footwear, taken along lines II-II in Fig. 1;

Fig. 4 is a simplified pictorial illustration of a drilling jig for preparing the footwear to receive the footwear attachment interface of Fig. 1, constructed and operative in accordance with an embodiment of the present invention;

Fig. 5 is a simplified pictorial illustration of a footwear attachment interface with an electrical connector, and an electrical attachment device connected to the electrical connector, constructed and operative in accordance with an embodiment of the present invention;

Figs. 6A and 6B are simplified pictorial illustrations of a variation of the embodiment of Fig. 5, further comprising a flexible extension connected to the electrical connector, wherein in Fig. 6A, the flexible extension is stored in an insert of the footwear attachment interface, and in Fig. 6B, the flexible extension is deployed from the insert;

Fig. 7 is a simplified pictorial illustration of another type of electrical attachment device, comprising a sensing device, constructed and operative in accordance with another embodiment of the present invention;

Fig. 8 is a simplified pictorial illustration of another type of electrical attachment device, comprising a cleaning device, constructed and operative in accordance with another embodiment of the present invention;

Fig. 9 is a simplified pictorial illustration of a foot paddle assembly, constructed and operative in accordance with an embodiment of the present invention;

Fig. 10 is a simplified pictorial illustration of the foot paddle assembly of Fig. 9 installed in the footwear attachment interface of the present invention; and

Fig. 11 is a simplified pictorial illustration of the foot paddle assembly of Fig. 9 folded into a flat configuration, in accordance with an embodiment of the present invention.

### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Figs. 1-3, which illustrate a footwear attachment interface 10, constructed and operative in accordance with an embodiment of the present invention.

Footwear attachment interface 10 may comprise an insert 12 inserted into a transverse hole 14 in a sole 16 of footwear 18. "Transverse" throughout the specification and claims means extending between (but not necessarily all the way through) medial and lateral sides of footwear 18. Medial refers to the side of the foot towards the midline of the body (the inner side), whereas lateral refers to the opposite (outer) side of the foot. Sole 16 may be pre-formed with hole 14 along a transverse axis 15, or hole 14 may be drilled in sole 16 with a drilling jig 40, shown and described further hereinbelow with reference to Fig. 4. Any number of footwear attachment interfaces 10 may be installed in footwear 18 at any position on sole 16. Footwear 18 may include, without limitation, shoes, slippers, sneakers, athletic footwear, and the like.

Insert 12 may comprise a tubular, hollow bushing 22 with an enlarged washer head 24 that sits against the outer surface of the side of sole 16. Figs. 2 and 3 show other examples of inserts. For example, an insert 26 may comprise a hollow bushing 28 that has an internally threaded portion 30. Another insert 32, with an externally threaded portion, may threadedly engage bushing 28. Inserts 12, 26 and 32 may be constructed of any suitable material, such as metal or plastic, for example, and may be threaded or non-threaded, smooth or non-smooth. It is appreciated that the invention is not limited to these examples, and other kinds of inserts may be used to carry out the invention.

Reference is now made to Fig. 4, which illustrates a drilling jig 40 for preparing the footwear 18 to receive the footwear attachment interface 10, constructed and operative in accordance with an embodiment of the present invention. Drilling jig 40 may comprise an adjustable band 42 with one or more drilling bushings 44 jutting from one or more of the sides of band 42 and oriented to facilitate drilling a transverse hole into the sole 16. Band 42 may be adjusted to fit the width, length and shape of the footwear 18. The spacing between drilling bushings 44 may also be adjustable. Drilling jig 40 may be used to drill transverse holes 14 in a sole 16. Afterwards, inserts 12 (and/or other inserts) may be installed in holes 14, and devices may be attached to inserts 12.

Reference is now made to Fig. 5. In accordance with an embodiment of the present invention, insert 12 may further comprise an electrical connector 50, which may comprise, without limitation, any kind of electrical contacts or pins. Electrical connector

50 may mate with an electrical attachment device 52, which may be inserted at least partially into insert 12. For example, in the illustrated embodiment, electrical connector 50 may comprise a male connector with one or more pins for mating with sockets of a female connector 54 of electrical attachment device 52. It is appreciated that other types and arrangements of connectors are possible within the scope of the invention.

A power source 56, such as but not limited to, a battery cell, may be disposed in insert 12 (or alternatively somewhere else in footwear 18) for supplying electrical current to electrical attachment device 52 via electrical connectors 50 and 54.

The types of electrical attachment devices 52 that may be attached to footwear 18 are limitless. For example, in Fig. 5, electrical attachment device 52 comprises a flashlight 58 with a light bulb 60. In the embodiment of Fig. 5, light bulb 60 protrudes out of insert 12 to the side of sole 16.

Reference is now made to Figs. 6A and 6B, which illustrate a variation of the embodiment of Fig. 5, wherein flashlight 58 comprises a flexible extension 62 connected by means of connector 54 to connector 50. Flexible extension 62 may comprise a flexible electrical cord or equivalent. In Fig. 6A, flexible extension 62 is stored in insert 12 and a cap 64 may be provided to close the open end of insert 12. In Fig. 6B, cap 64 has been removed and flexible extension 62 is shown deployed from insert 12. Flashlight 58 may be pointed in any direction or placed on any object.

Reference is now made to Fig. 7, which illustrates placement of another type of electrical attachment device into insert 12 and connection to connector 50, in this embodiment a sensing device 70. Again, cap 64 may close the open end of insert 12. Sensing device 70 may comprise any single or combination of sensors for measuring a variety of biological or physical phenomena or activities, such as but not limited to, devices for measuring distance/speed/acceleration of the wearer, or devices for measuring weight, stress, strain, perspiration, heartbeat, etc.

Reference is now made to Fig. 8, which illustrates electrical connection of a cleaning device 74 to connector 50. Cleaning device 74 may comprise, without limitation, a brush 76 for brushing or polishing surfaces such as shoes, for example.

It is appreciated that flexible extension 62 may be used with any of the embodiments of the invention.

Another device which may be attached to footwear 18 by fastening to inserts 12 is a foot paddle, such as that described in US Patent 6,257,998 to Ein-Gal. The foot paddle of US Patent 6,257,998 includes a racket with a ball rebound surface bounded by a

perimeter wall. The racket includes a forefoot portion, configured to overlay a forefoot of the footwear, and which generally does not extend medially beyond the forefoot of the footwear and does not extend outwards beyond a toe portion of the footwear. A lateral portion extends laterally beyond the footwear. A mounting bracket may be mounted on the footwear, and the mounting bracket may be fixedly inserted in inserts 12.

Reference is now made to Figs. 9, 10 and 11, which illustrate a different kind of foot paddle assembly 100, constructed and operative in accordance with an embodiment of the present invention. Foot paddle assembly 100 may comprise a forefoot racket 102, a medial racket 104 and/or a lateral racket 106. Each of the rackets may comprise a ball rebound surface 108, which may be bounded by a perimeter wall 110. Ball rebound surface 108 and perimeter wall 110 may be constructed as one integral piece, such as by molding a thermoplastic material, for example. Alternatively, ball rebound surface 108 may be constructed separately and attached to perimeter wall 110. Ball rebound surface 108 may be constructed of a plurality of crossed rebound members 112, such as integrally molded plastic walls which cross each other generally at right angles, or alternatively, interlaced twine, cat gut or other string-type materials, such as traditionally used in tennis rackets.

One or both of medial racket 104 and lateral racket 106 may comprise mounting elements 114 that medially protrude therefrom (Fig. 9), and which may be fixedly or removably inserted in inserts 12 of footwear 18 (Fig. 10). As mentioned hereinabove, the insert 12 may comprise an internally threaded hollow bushing, or an externally threaded insert, or may be threaded or non-threaded, other kinds of smooth or non-smooth inserts. Accordingly, mounting elements 114 may be threaded or non-threaded, smooth or non-smooth, and mate with the inserts 12. Mounting elements 114 may be constructed of any suitable material, such as metal or plastic, for example.

Forefoot racket 102 may be hinged to one or both of medial racket 104 and lateral racket 106 by a hinged connection 113. In this manner, as seen in Fig. 11, foot paddle assembly 100 may be folded into a generally, flat configuration for easy insertion and carrying in a package 115. The hinged connection 113 between the rackets may be a detachable connection that permits detaching one racket from another racket. The hinged connection 113 between the rackets may be spring-loaded, such that the foot paddle assembly 100 turns into a rigid body upon insertion into inserts 12. Support elements 116 may be provided that extend from one racket to another, such as but not limited to, metal

or plastic rods pivotally attached (permanently or removably) to the rackets. Support elements 116 may enhance the rigidity and strength of foot paddle assembly 100.

As similarly shown in US Patent 6,257,998, a shock absorber 118 may be positioned between the footwear 18 and any of the rackets 102, 104 and 106 to absorb the shock of a ball impacting the rackets. Shock absorber 118 may be constructed of any elastomeric material, such as rubber or neoprene, or of a plastic foam, for example.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.